

60% PRELIMINARY PLANS

ALL INFORMATION CONTAINED WITHIN

IS TO BE CONSIDERED PRELIMINARY

NOT FOR CONSTRUCTION

US-191 Over the Colorado River Bridge Replacement Project

Moab, Utah

Cast-in-Place Balanced Cantilever Construction



191
U.S.

UTDOT
CONNECTING COMMUNITIES
Region 4

Reggie Walden, P. E.

- **Position**
- **Experience / Work History**
- **Current Assignment - ARB**



Agenda

- **Discussion**
 - **Balanced Cantilever Construction**
 - **Similar Successful Projects**
 - **Allegheny River Bridge**
- **Questions / Working Session**



Similar Successful Projects - FIGG

- **Smart Road Bridge – Blacksburg, VA**
- **Wabasha Freedom Bridge – St. Paul, Mn**
- **Allegheny River Bridge – Pittsburgh, PA**



Smart Road Bridge

Blacksburg, Virginia



Smart Road Bridge

Blacksburg, Virginia

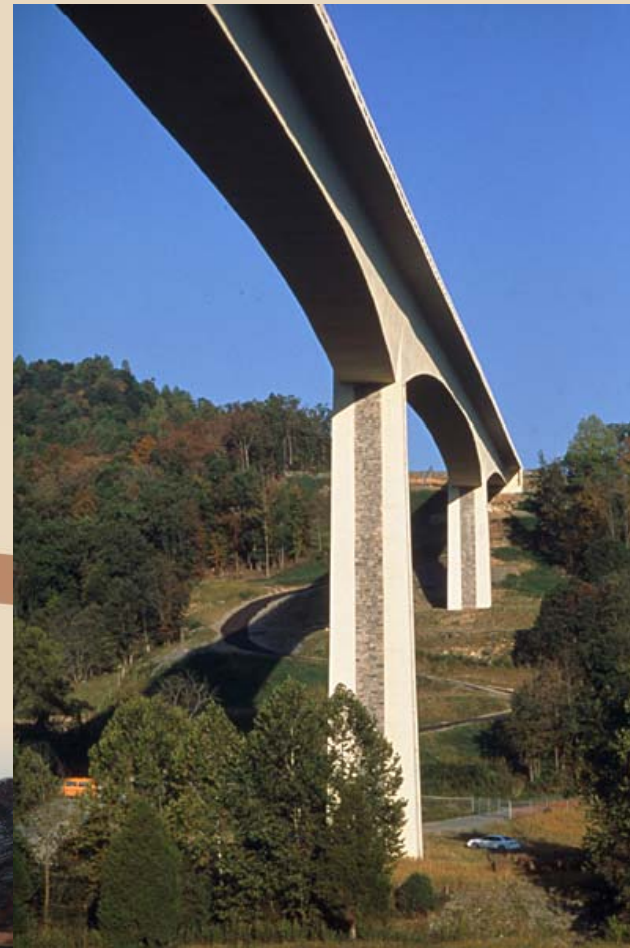
- **5 Spans (284', 472', 472', 472', 284')**
- **Girder Depth (31' at Piers, 12' at Midspan)**
- **Typical Segment Length - 16 feet**



Smart Road Bridge

Blacksburg, Virginia

- **Single Cell Box**
- **39' Wide**
- **167' Tall Hollow Piers w/ Inlaid Stone**



Wabasha Freedom Bridge

St. Paul, Minnesota



Wabasha Freedom Bridge

St. Paul, Minnesota

- **4 Spans (230', 392', 392', 230')**
- **Girder Depth (20' at Piers, 8' at Midspan)**
- **Typical Segment Length - 16 feet**
- **Twin Wall Diaphragms & Piers**



Wabasha Freedom Bridge

St. Paul, Minnesota

- **Twin Structures**
- **Single Cell Box (each)**
- **48' Wide (each)**



Allegheny River Bridge

Pittsburgh, Pennsylvania



Allegheny River Bridge

Pittsburgh, Pennsylvania

- **6 Spans (285, 380, 380, 444, 532, 329)**
- **Girder Depth (19' & 25' at Piers, 11' at Midspan)**
- **Typical Segment Length – 16 Feet**
- **Twin Wall Diaphragms & Piers**



Allegheny River Bridge

Pittsburgh, Pennsylvania

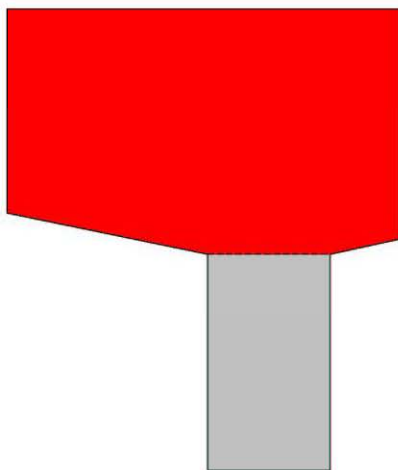
- **Twin Structures**
- **Single Cell Box (each)**
- **Variable Width 61' -73'**



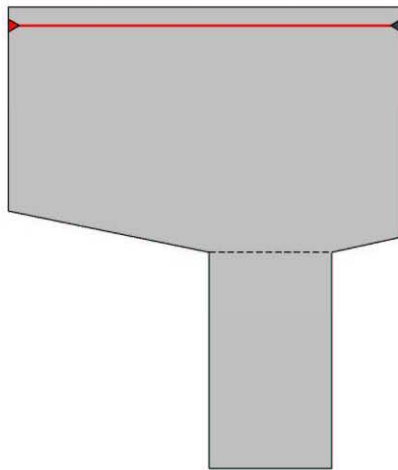
Basic Casting Procedure



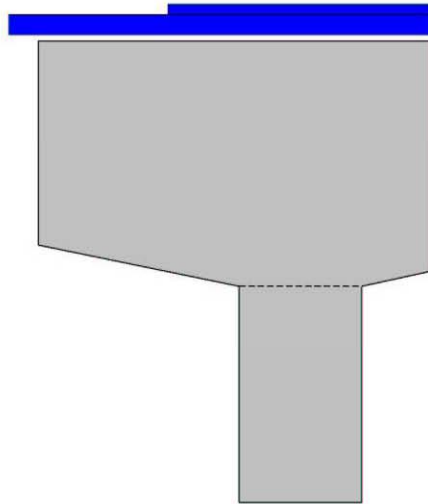
Cast Pier Table



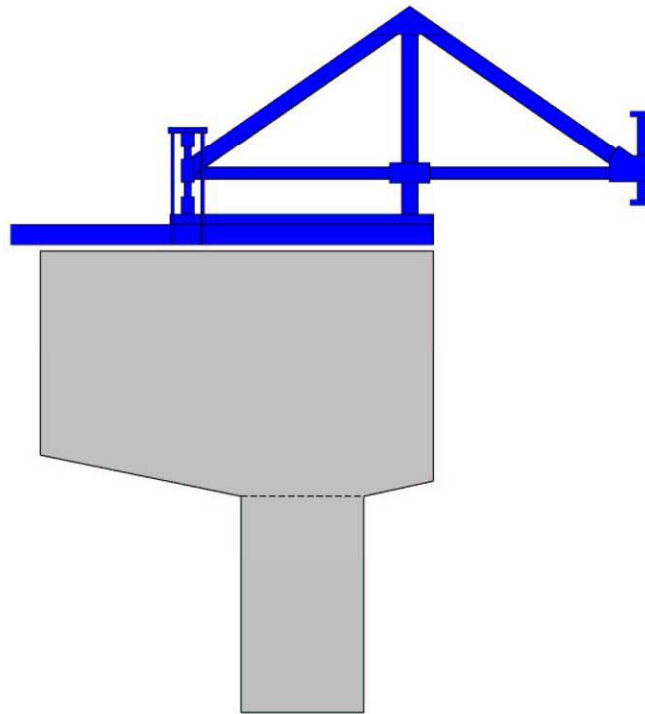
Stress Pier Table Cantilever Tendons



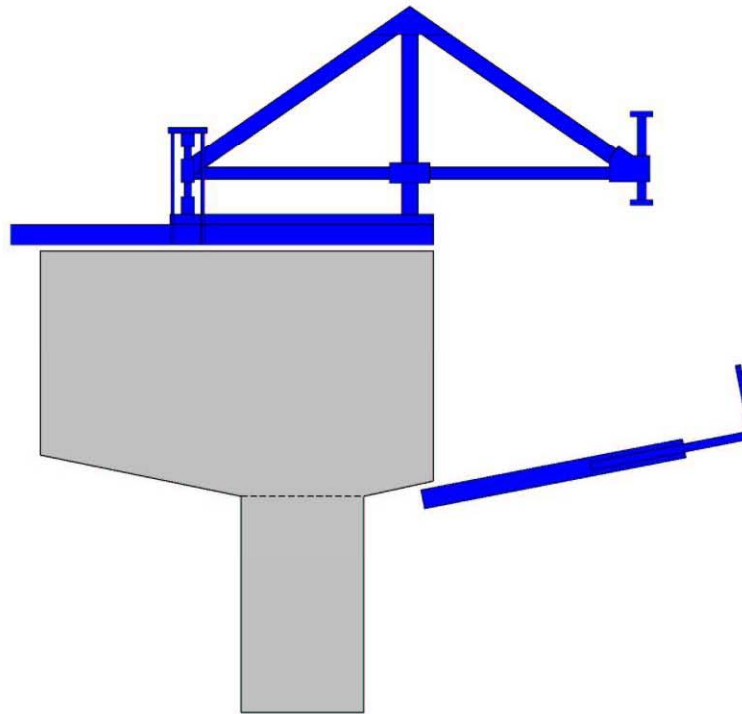
Assemble Traveler A



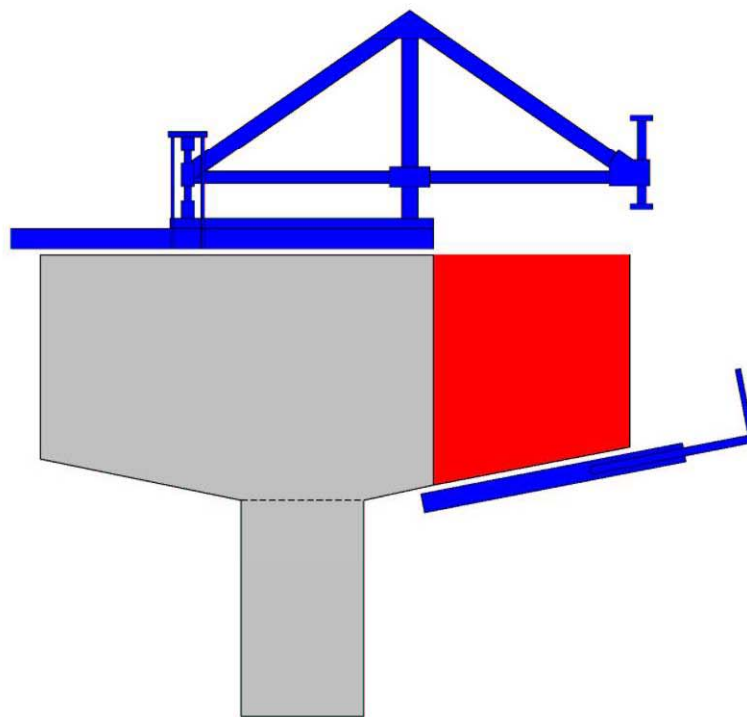
Assemble Traveler A



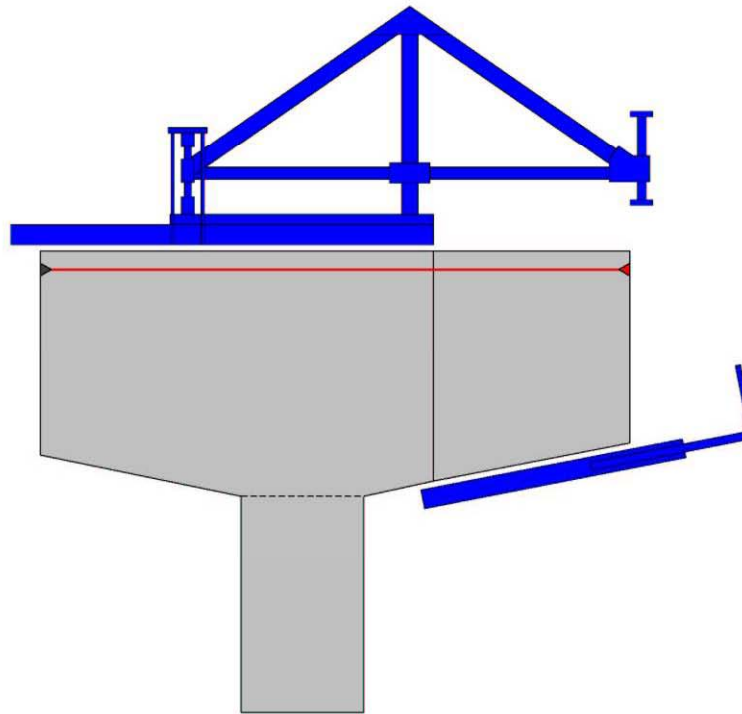
Assemble Traveler A



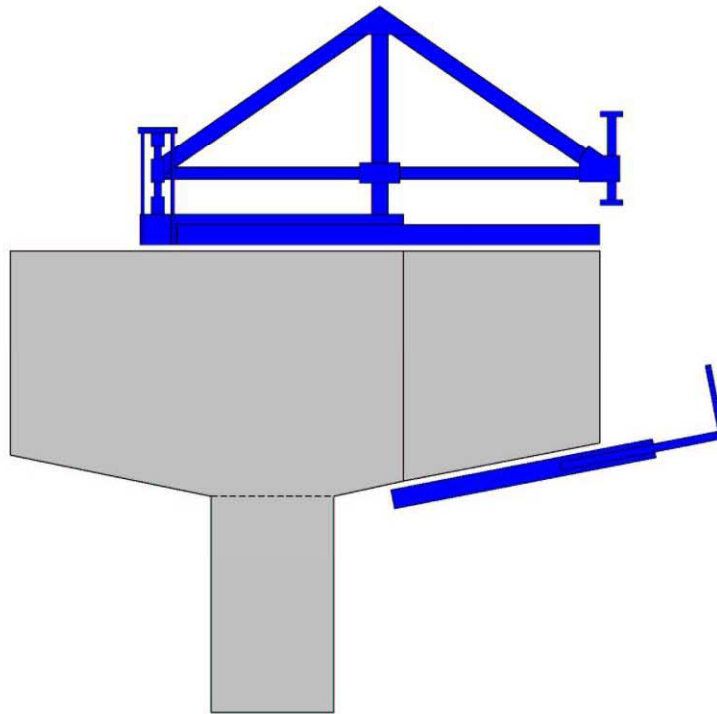
Cast Segment 1



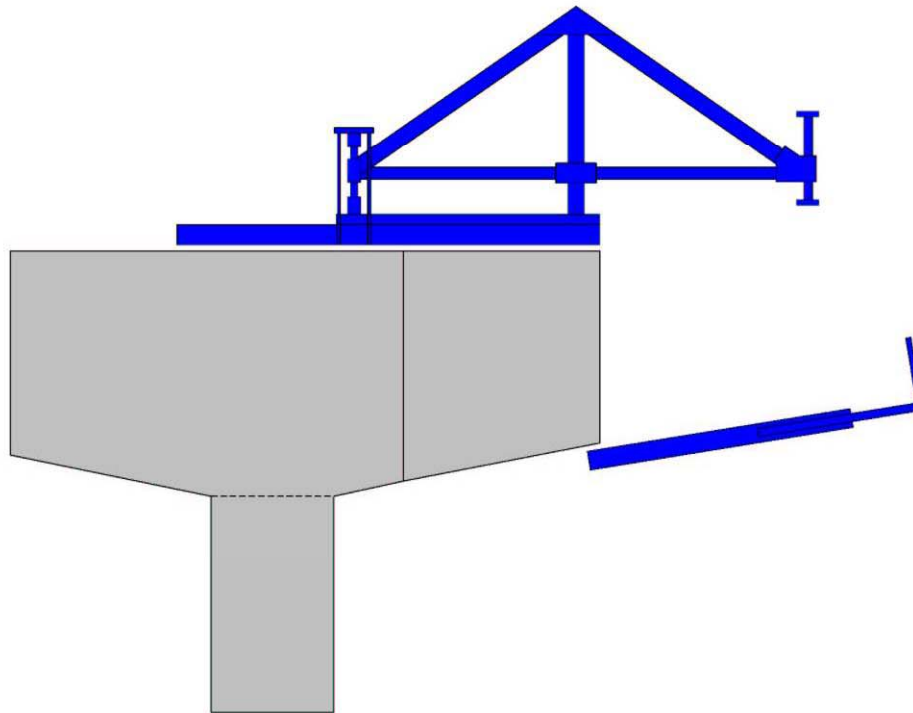
Stress Cantilever Tendon



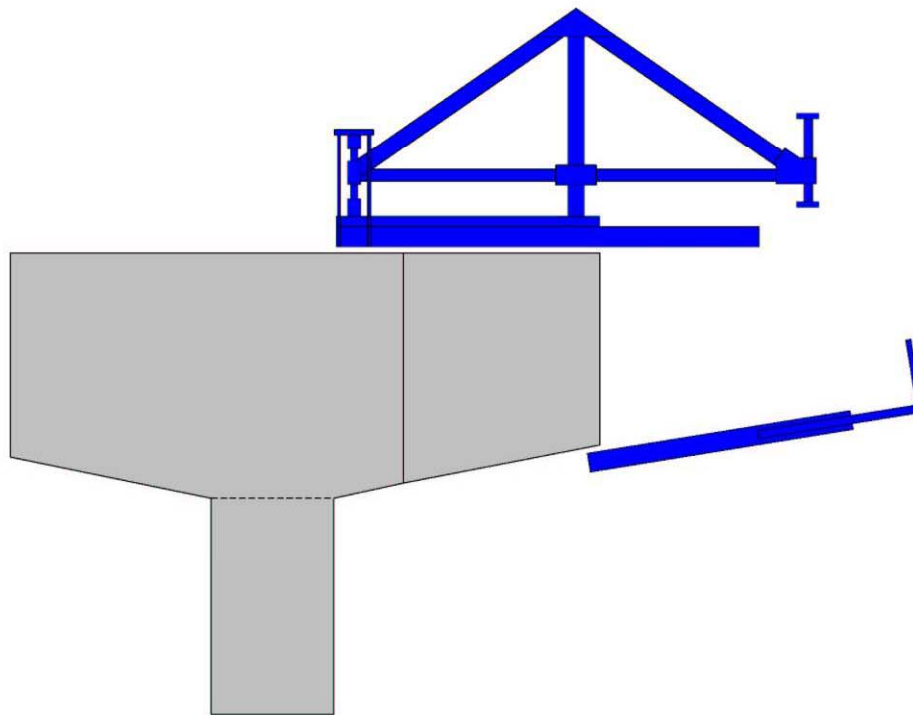
Launch Traveler A



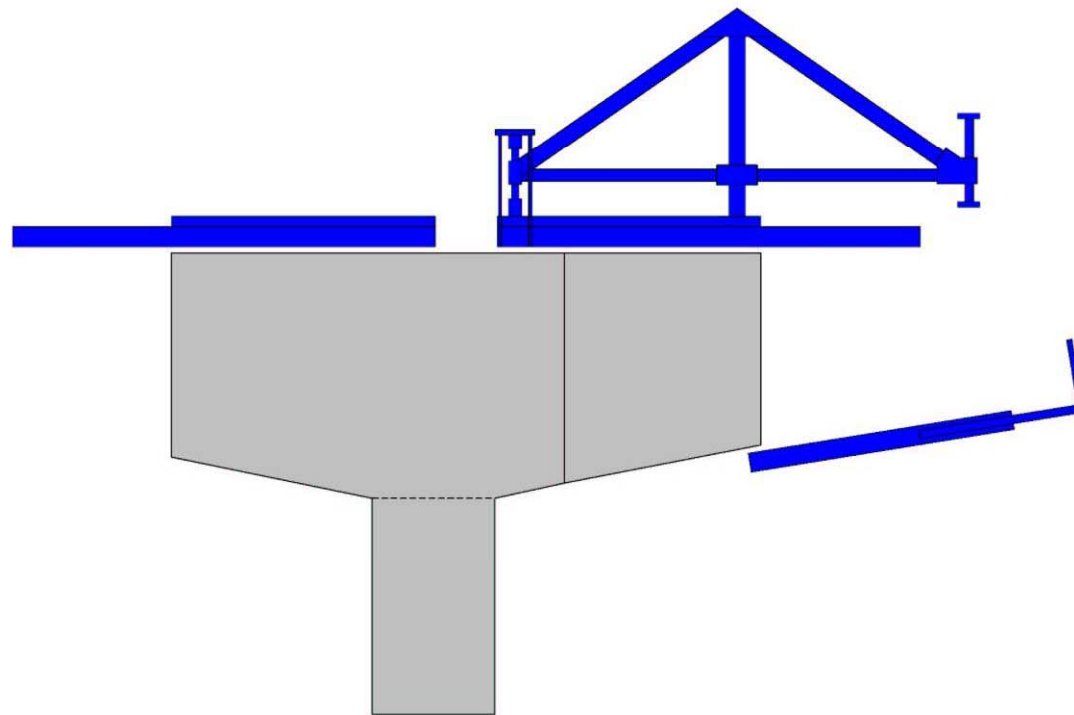
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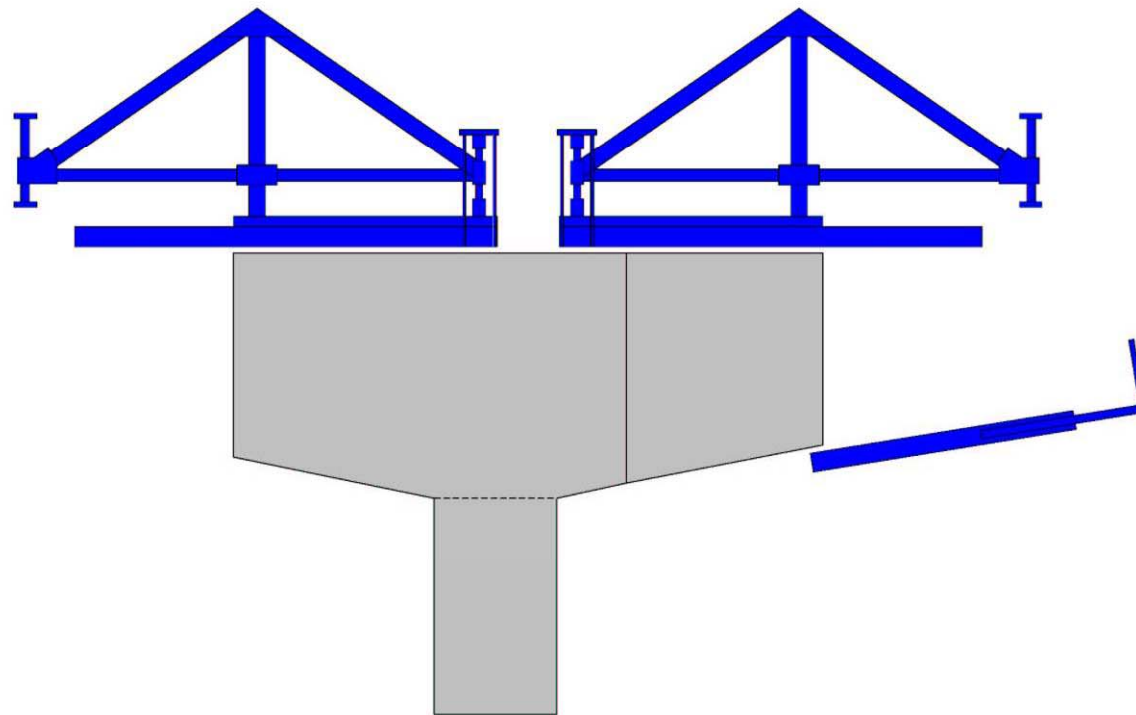
Launch Traveler A



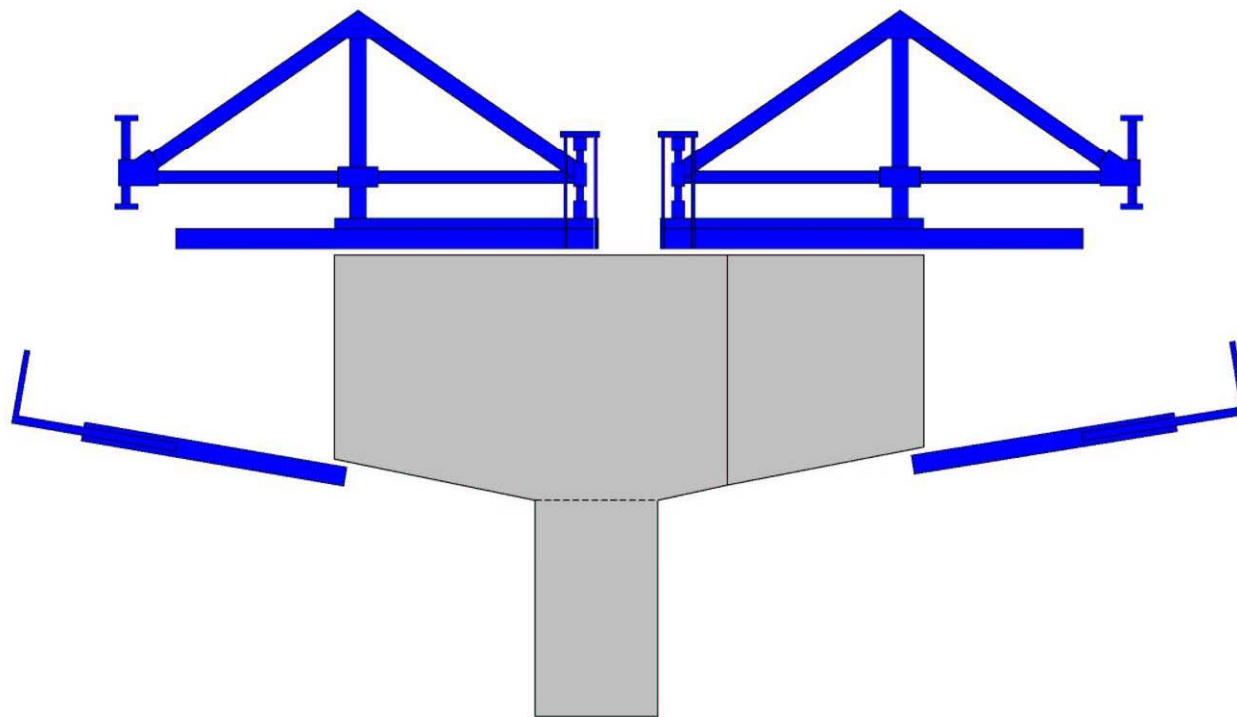
Install Traveler B



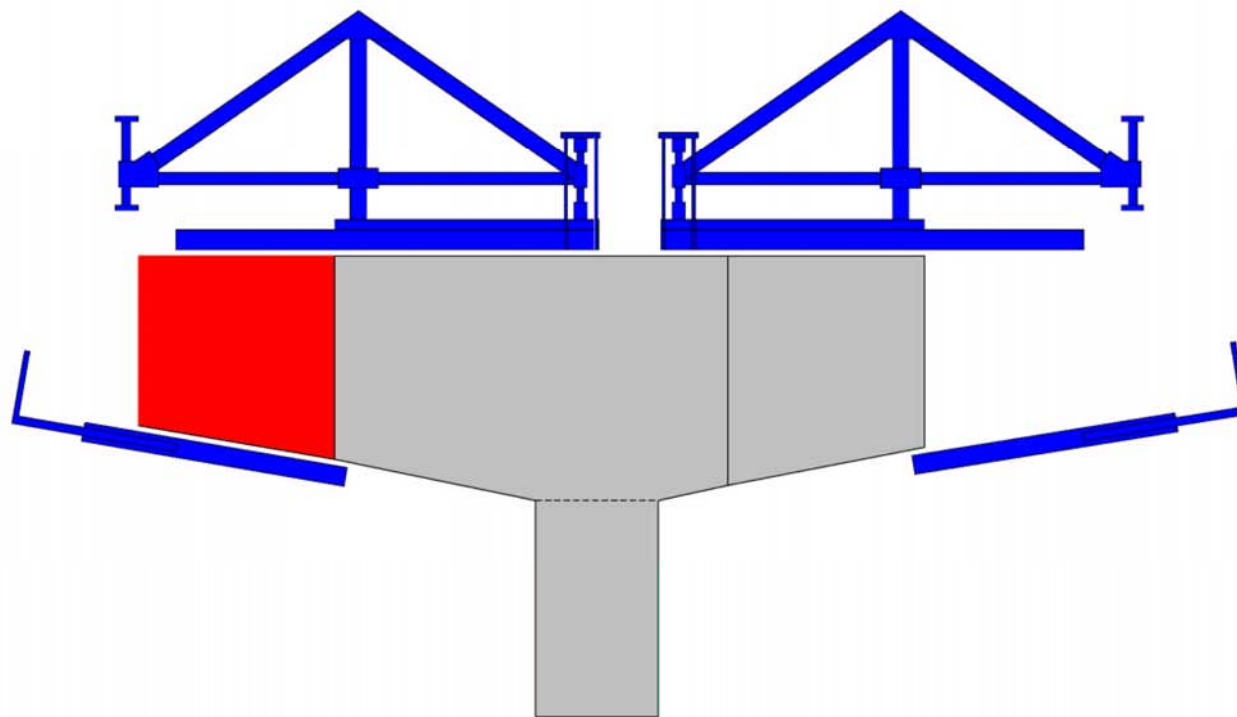
Install Traveler B



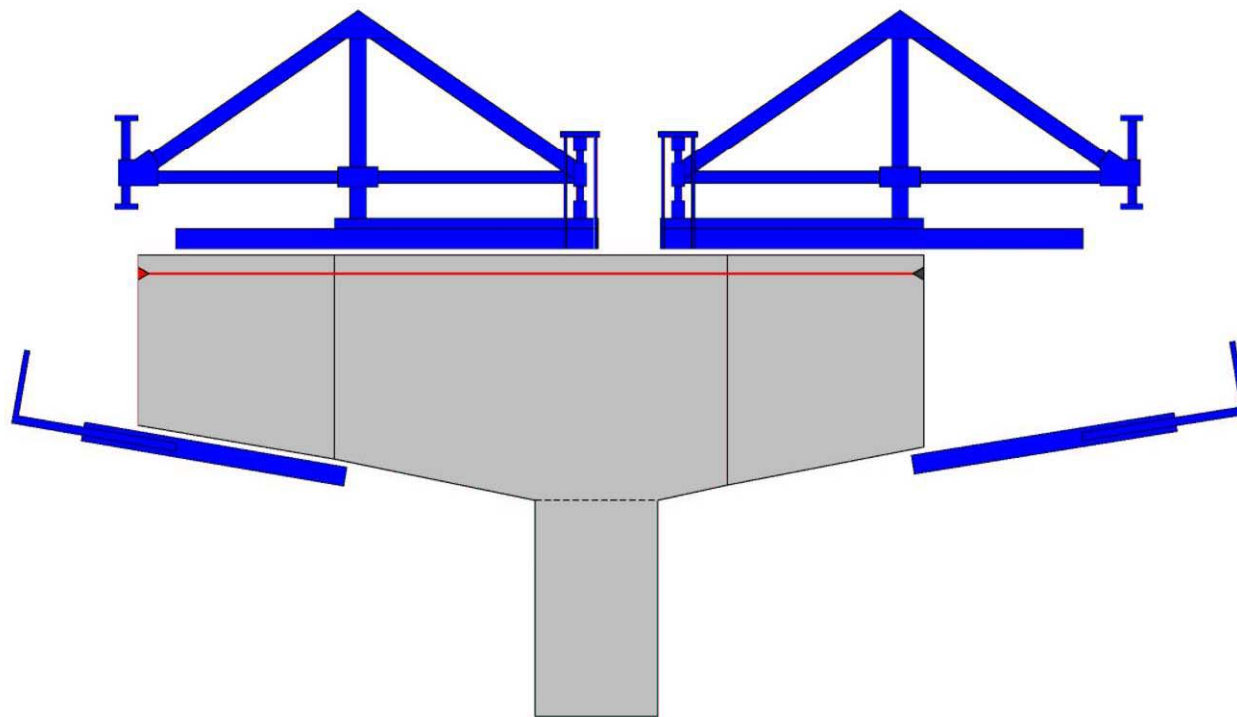
Install Traveler B



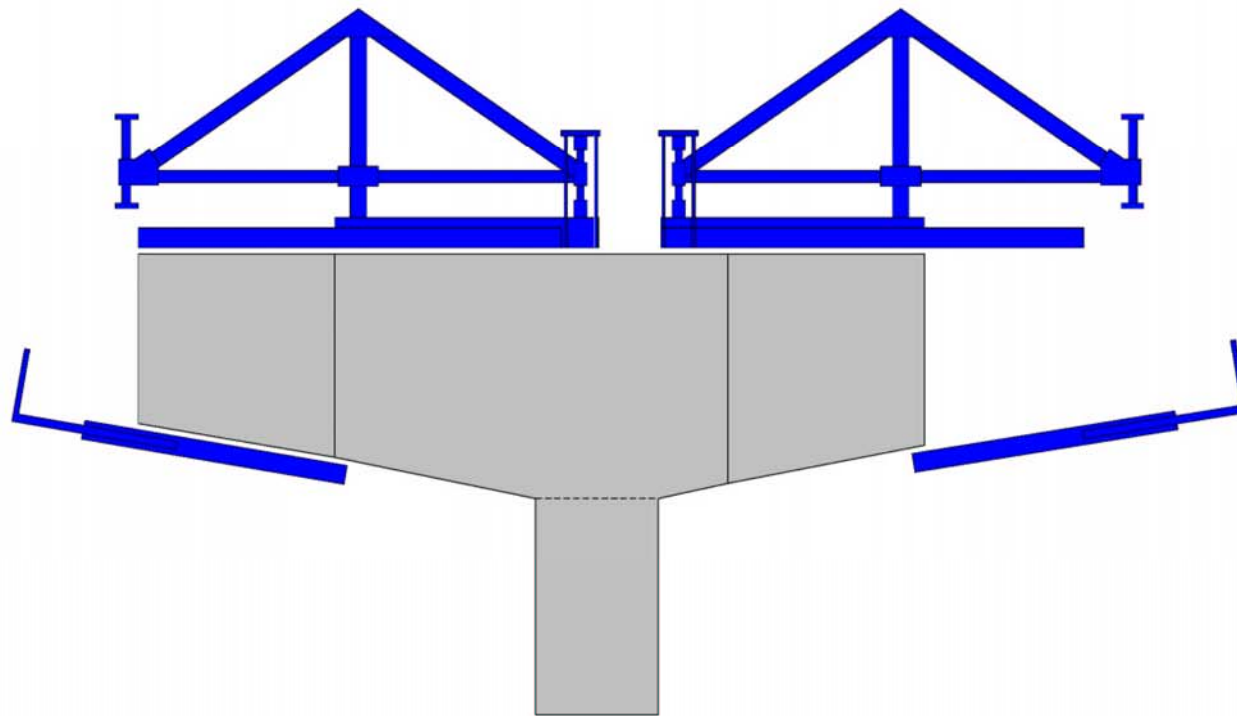
Cast Segment 2



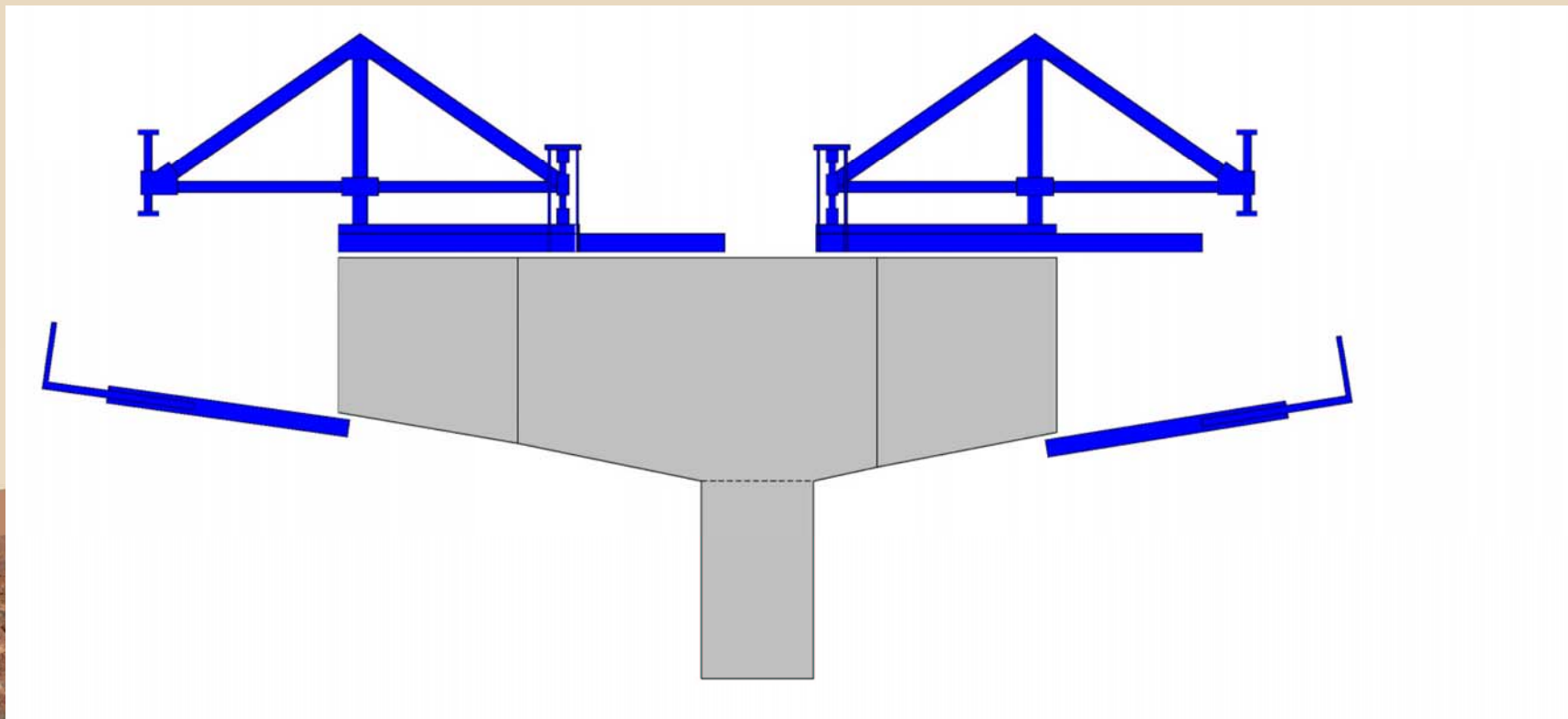
Stress Cantilever Tendon



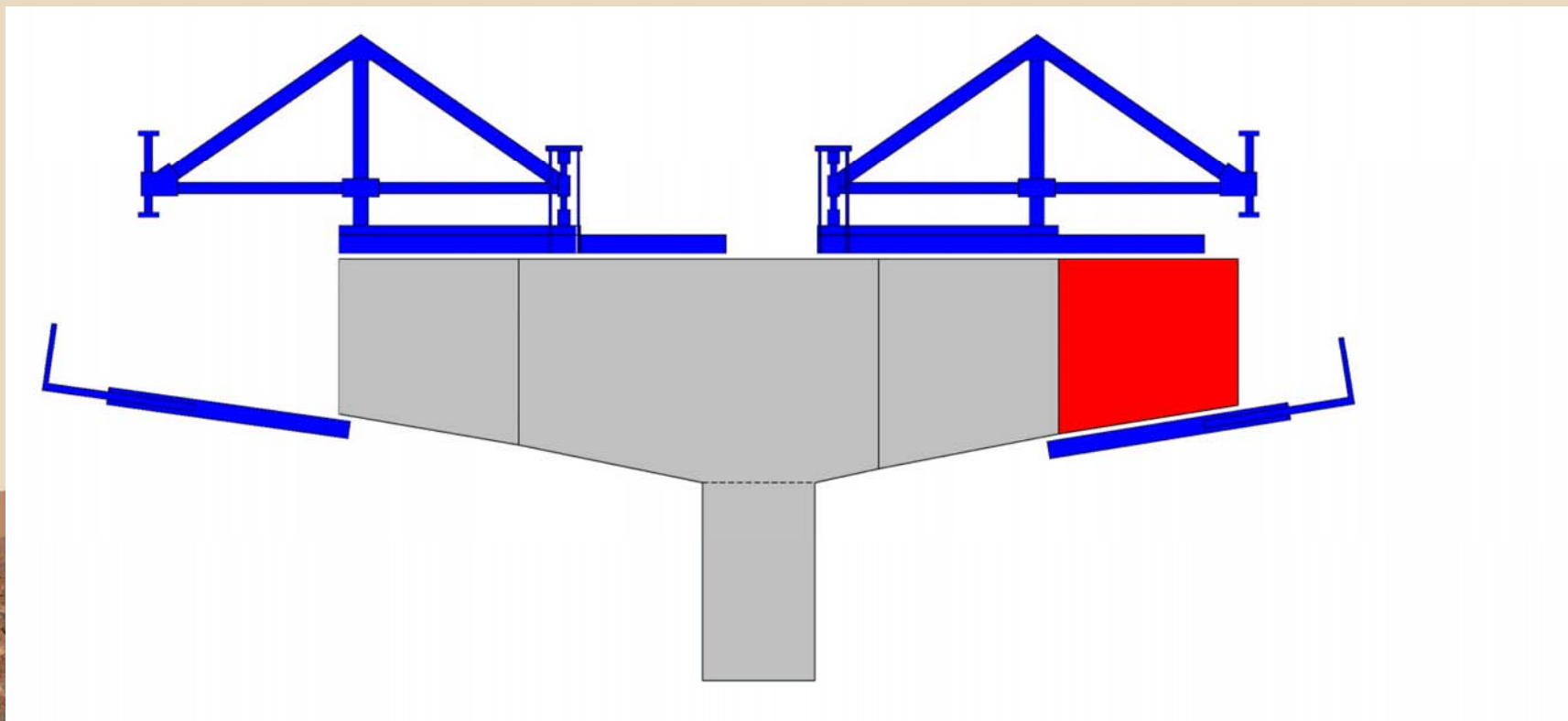
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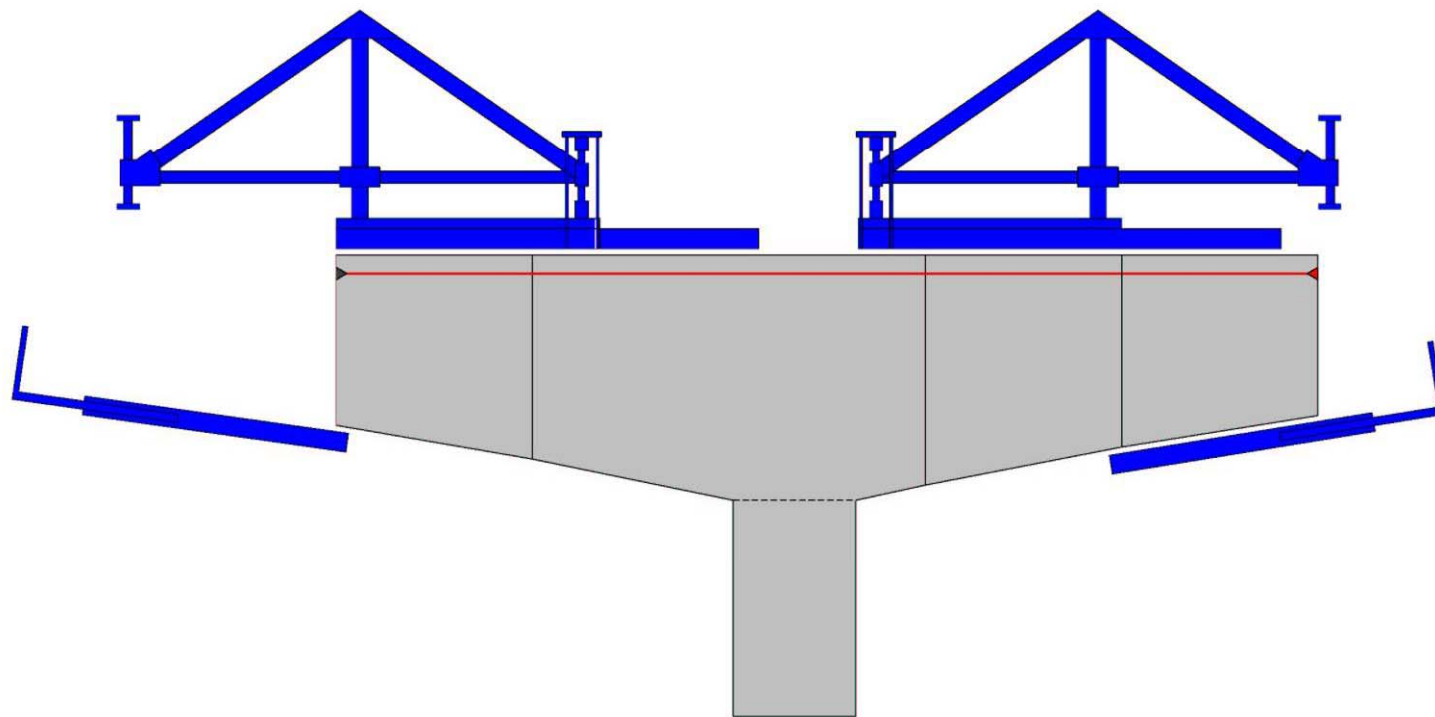
Launch Traveler B



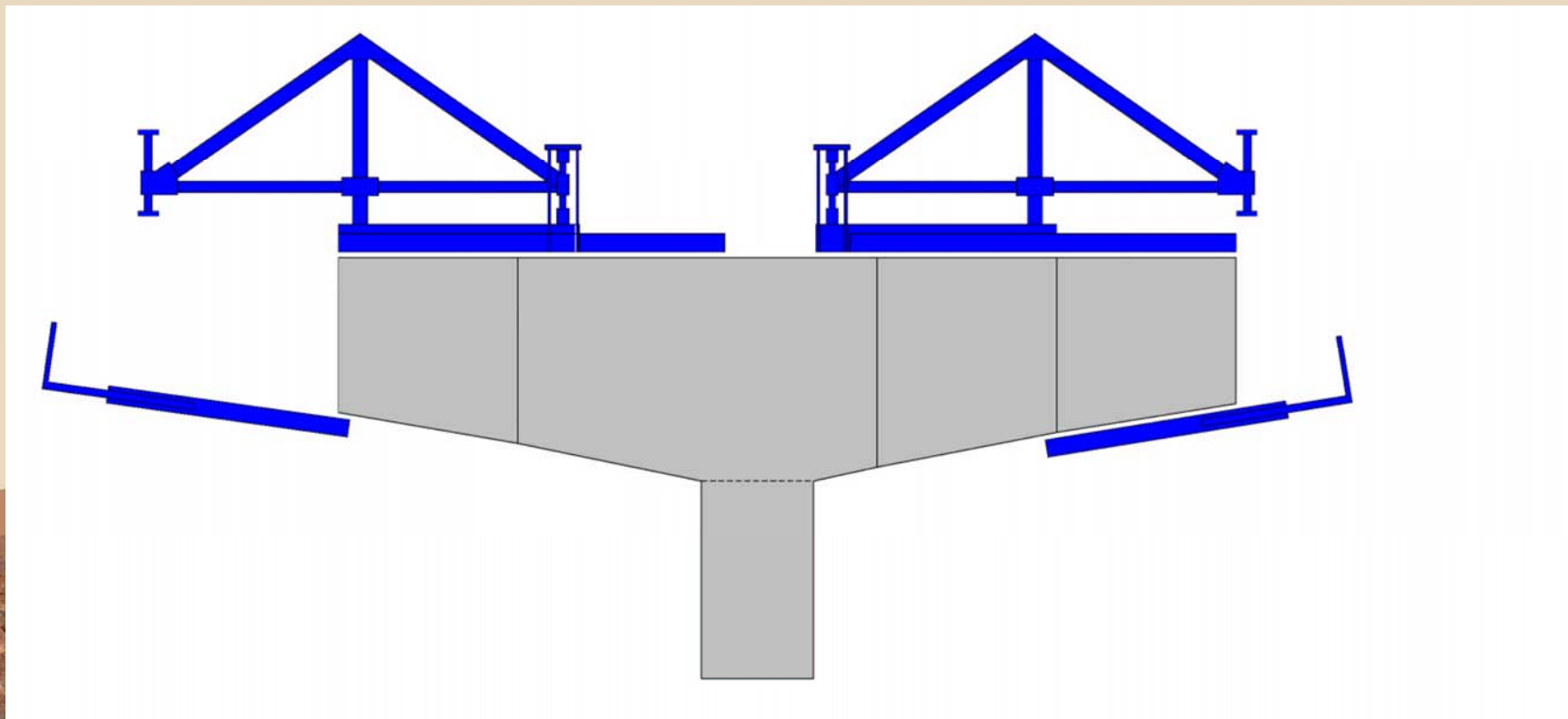
Cast Segment 3



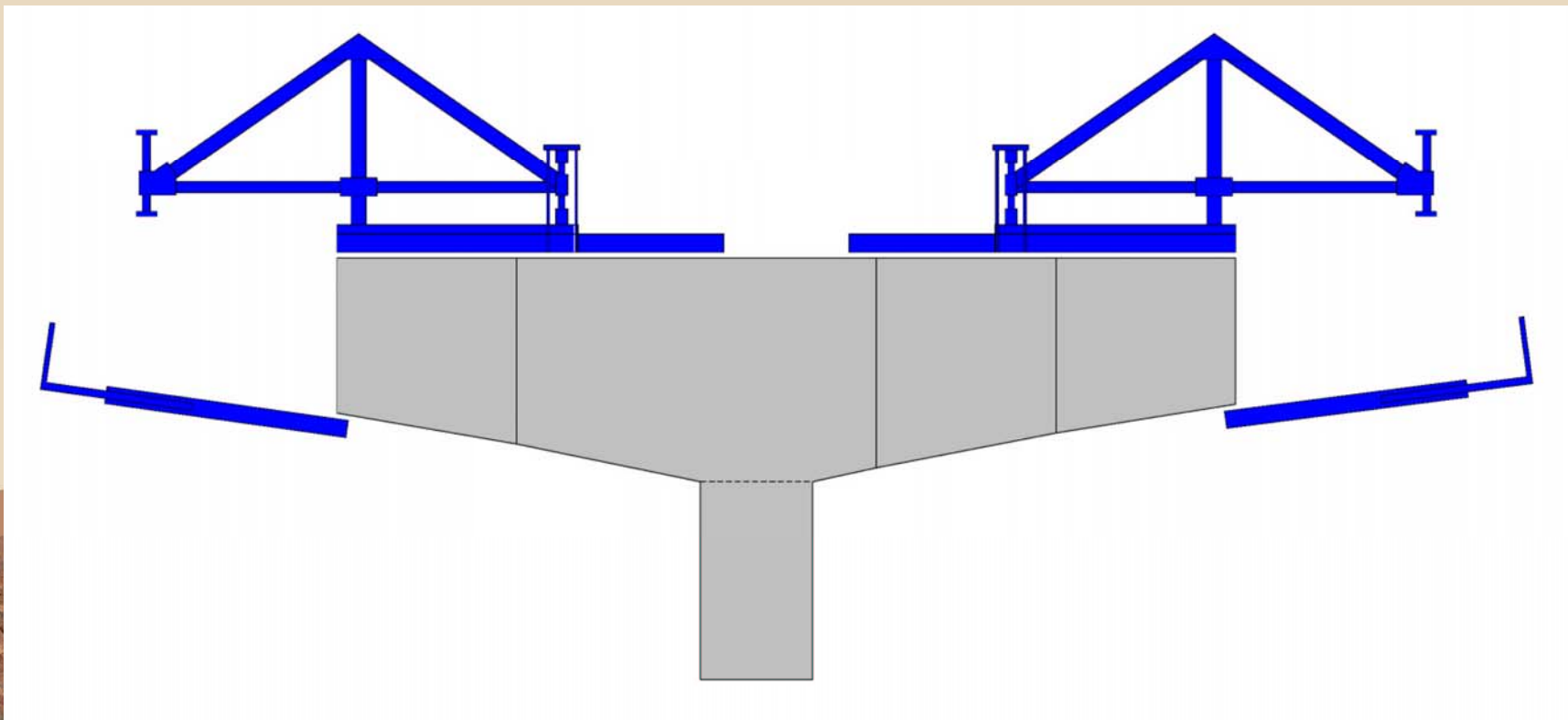
Stress Cantilever Tendon



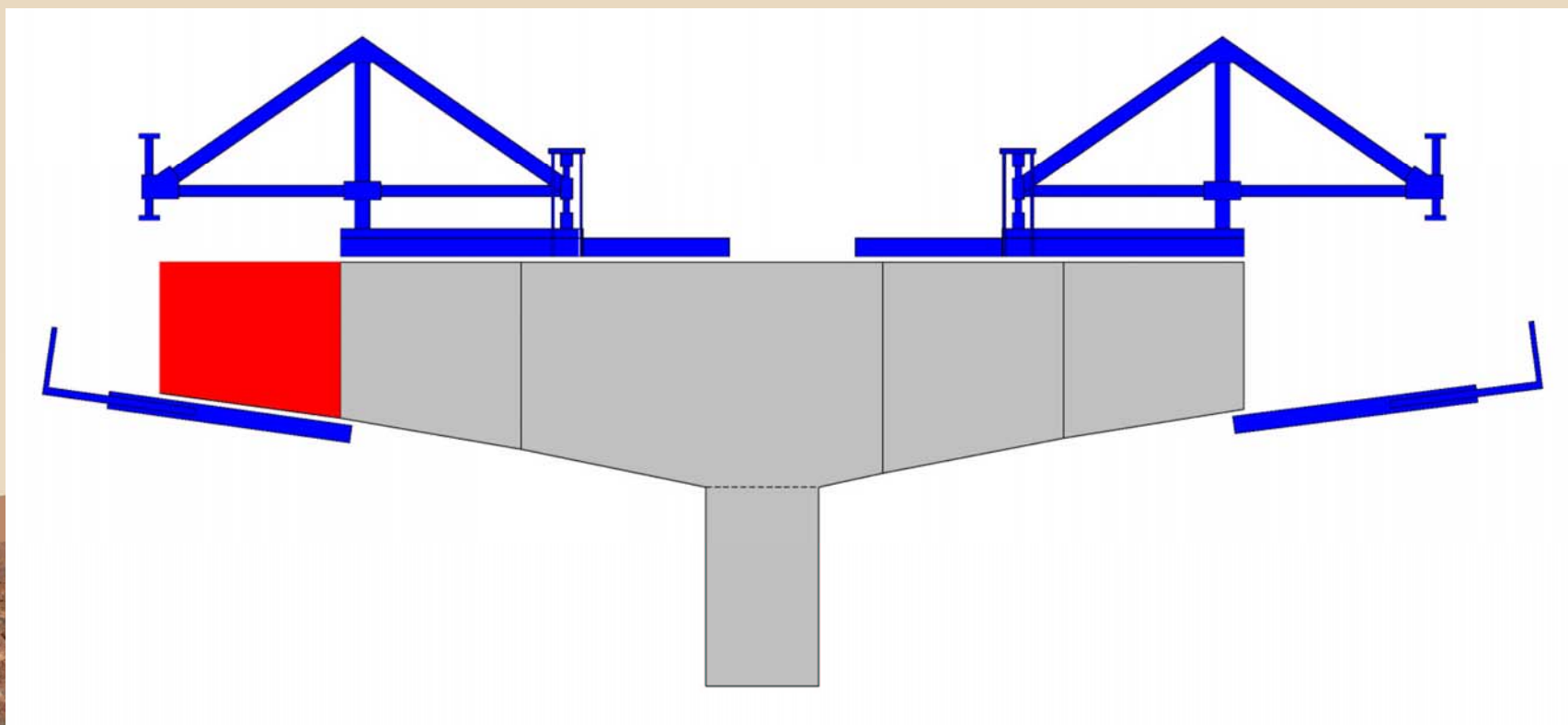
Launch Traveler A



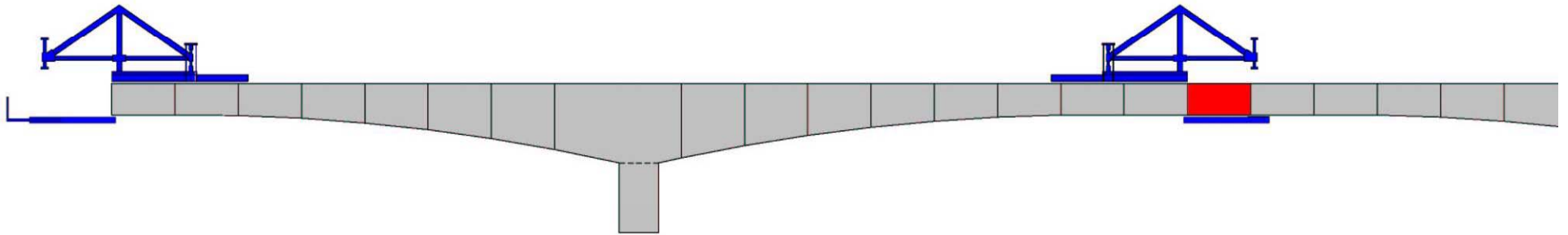
Launch Traveler A



Cast Segment 4



Repeat and Cast Closures

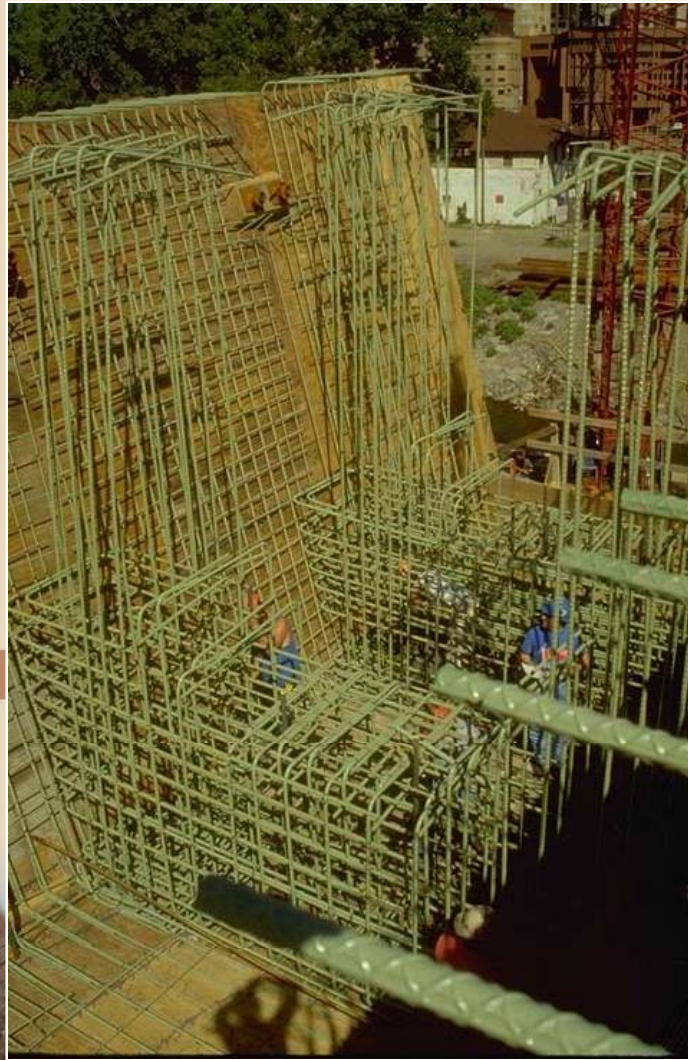


Pier Table Construction



Falsework Attached to Pier Stem

Pier Table Construction



Pier Table Construction

Cast in Stages

Typical Duration: 30 Days



Pier Table Construction



Pier Table Construction



Form Traveler Assembly

Launching Rails



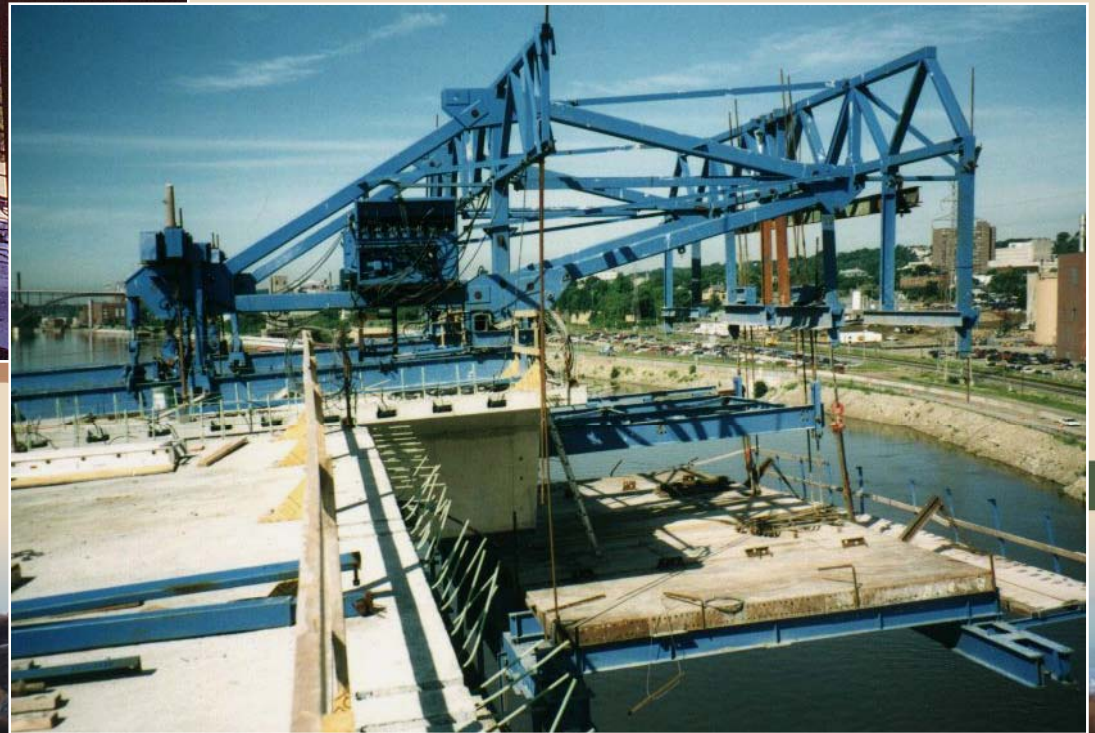
Form Traveler Assembly

Overhead Trusses



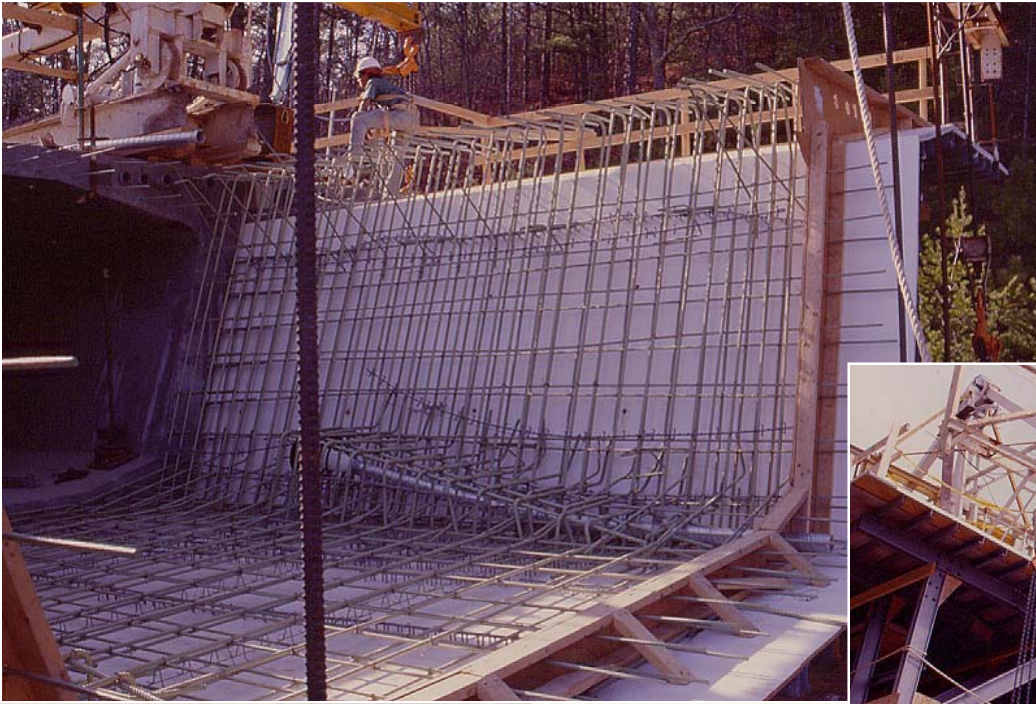
Form Traveler Assembly

Bottom Form Deck



Form Traveler Assembly

Web and Core Forms

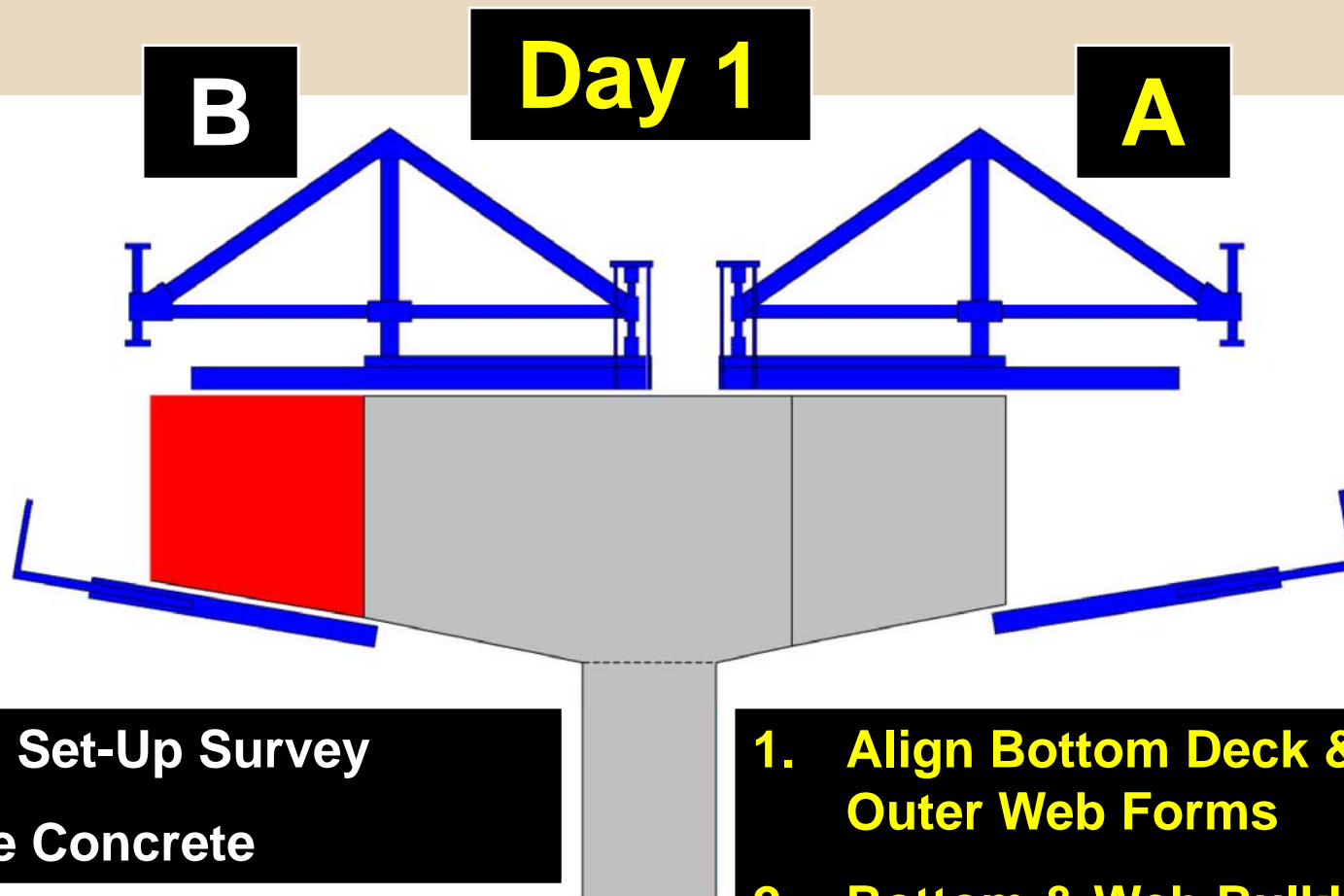


Form Traveler Assembly

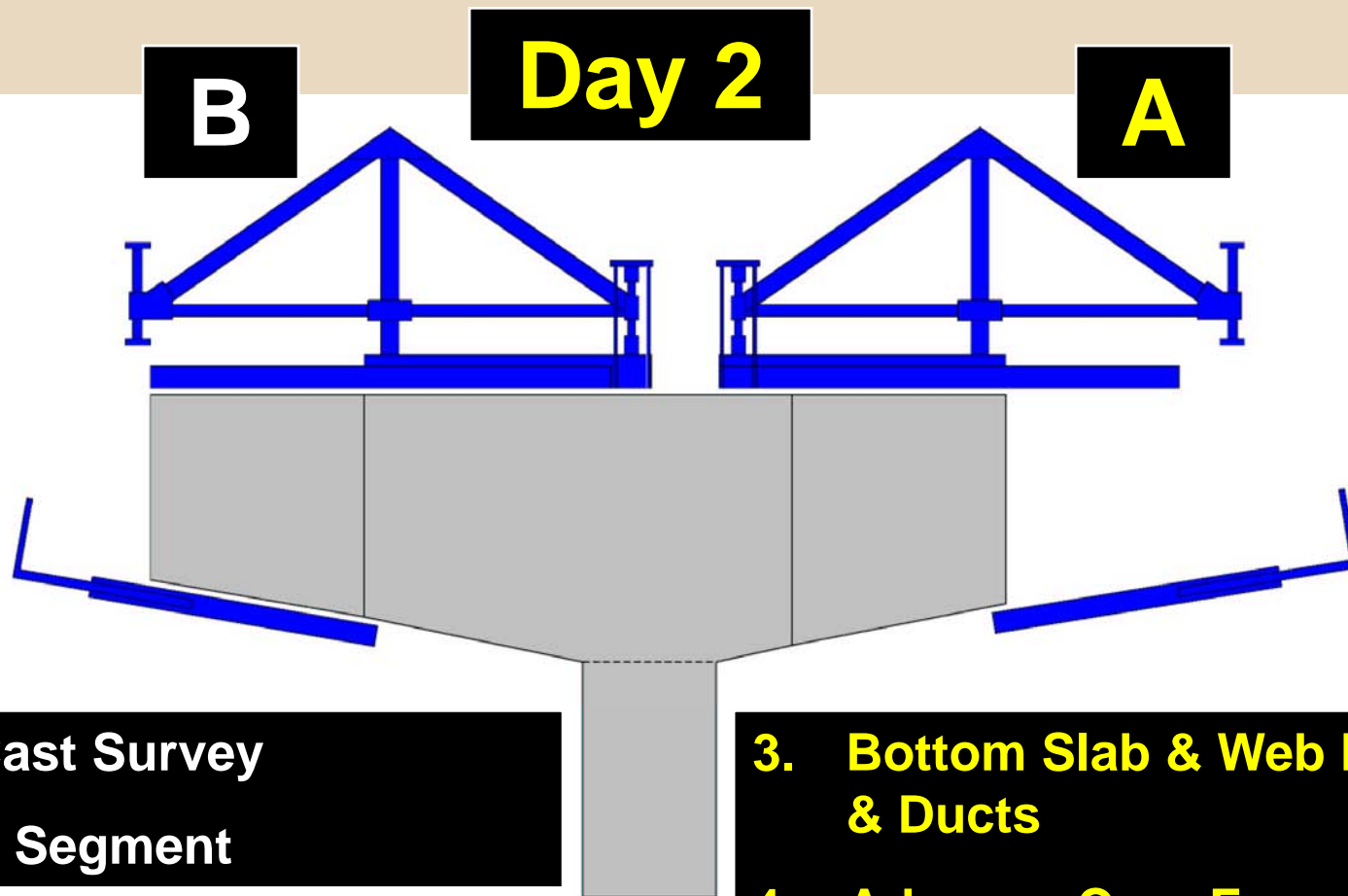
- **Typical Duration**
 - 5 Weeks 1st Cantilever
 - 3 Weeks Subsequent Cantilevers
- **“Learning Curve”**



Segment Casting Cycle



Segment Casting Cycle

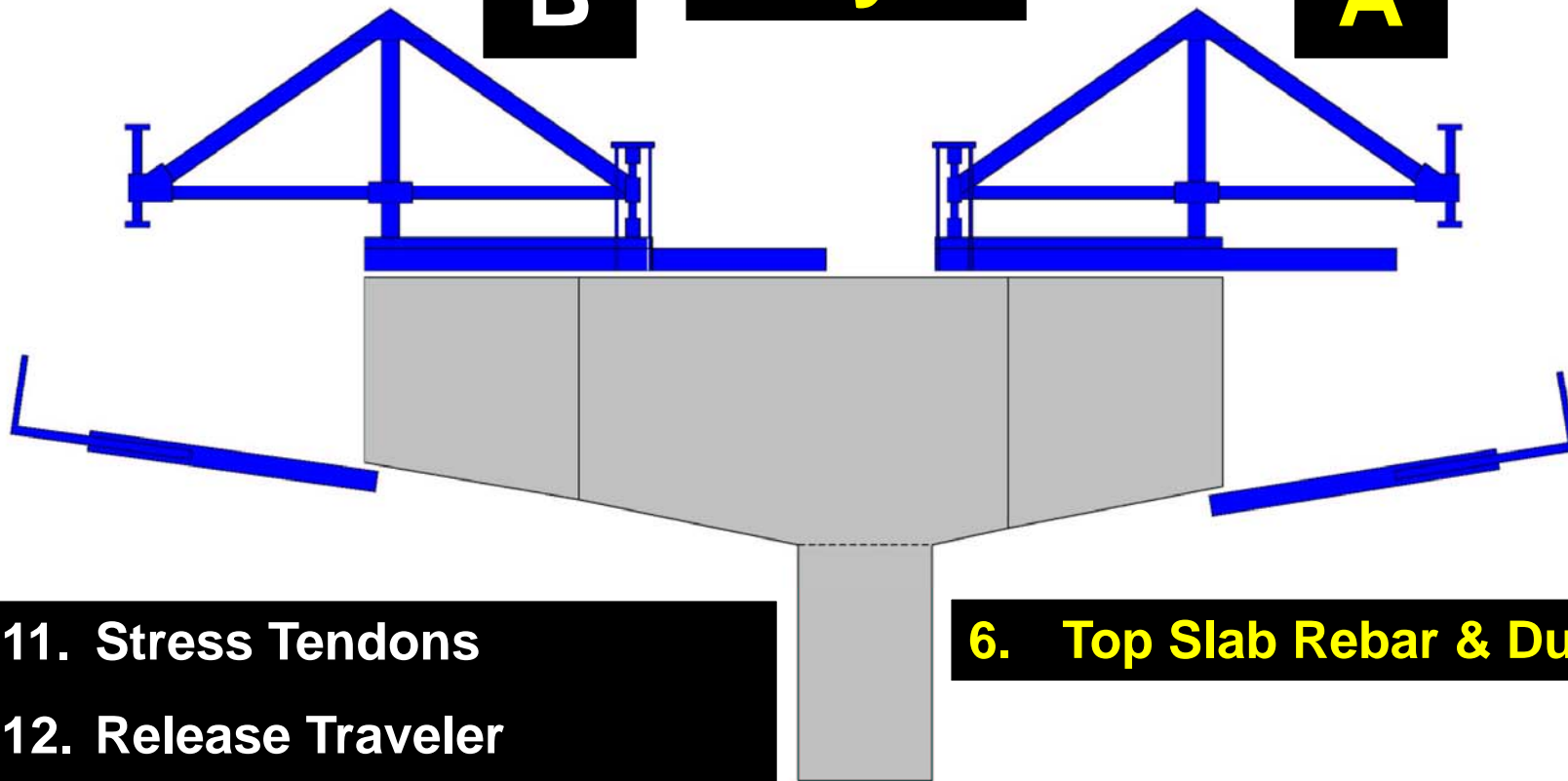


Segment Casting Cycle

Day 3

B

A



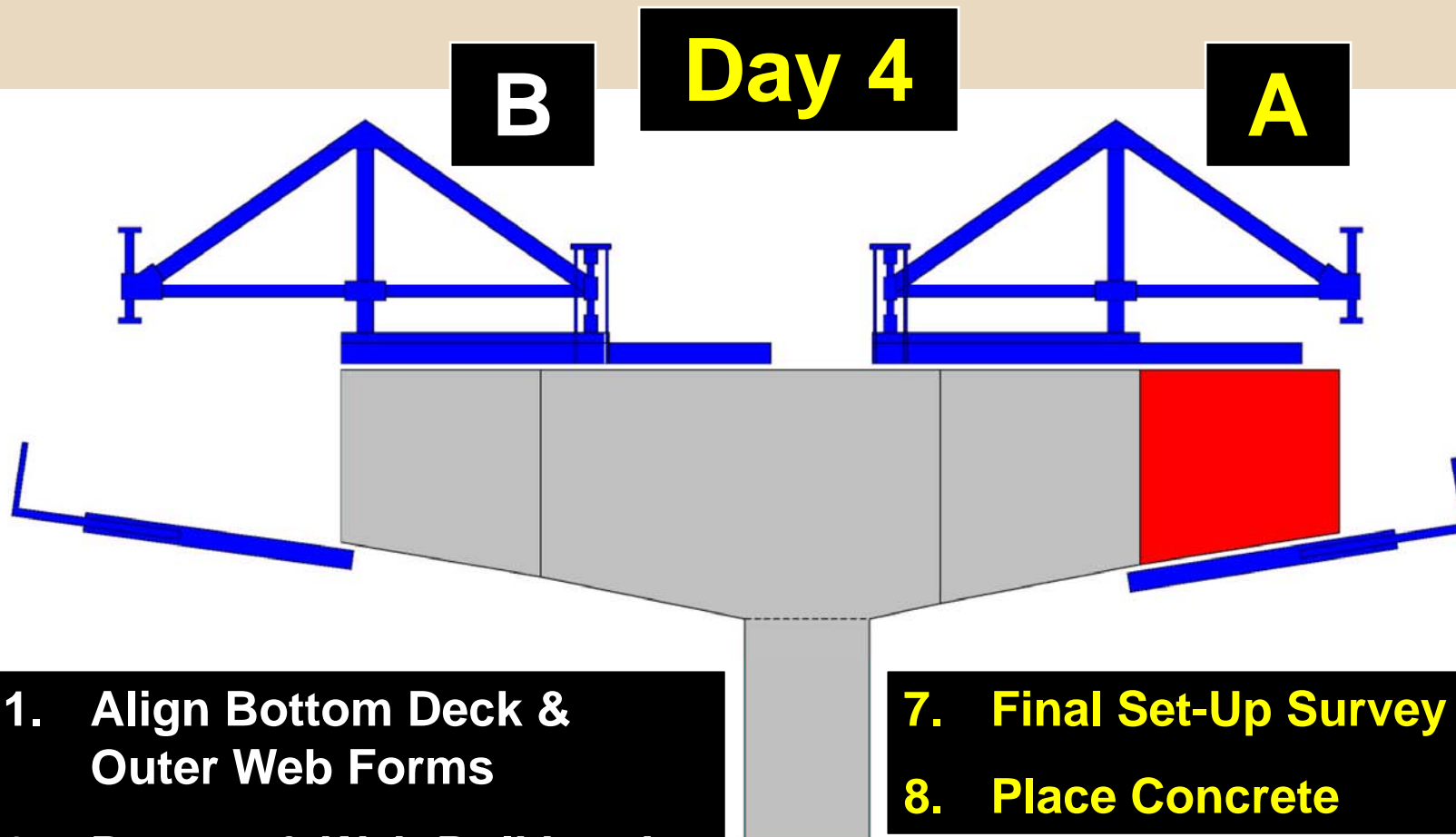
11. Stress Tendons

12. Release Traveler

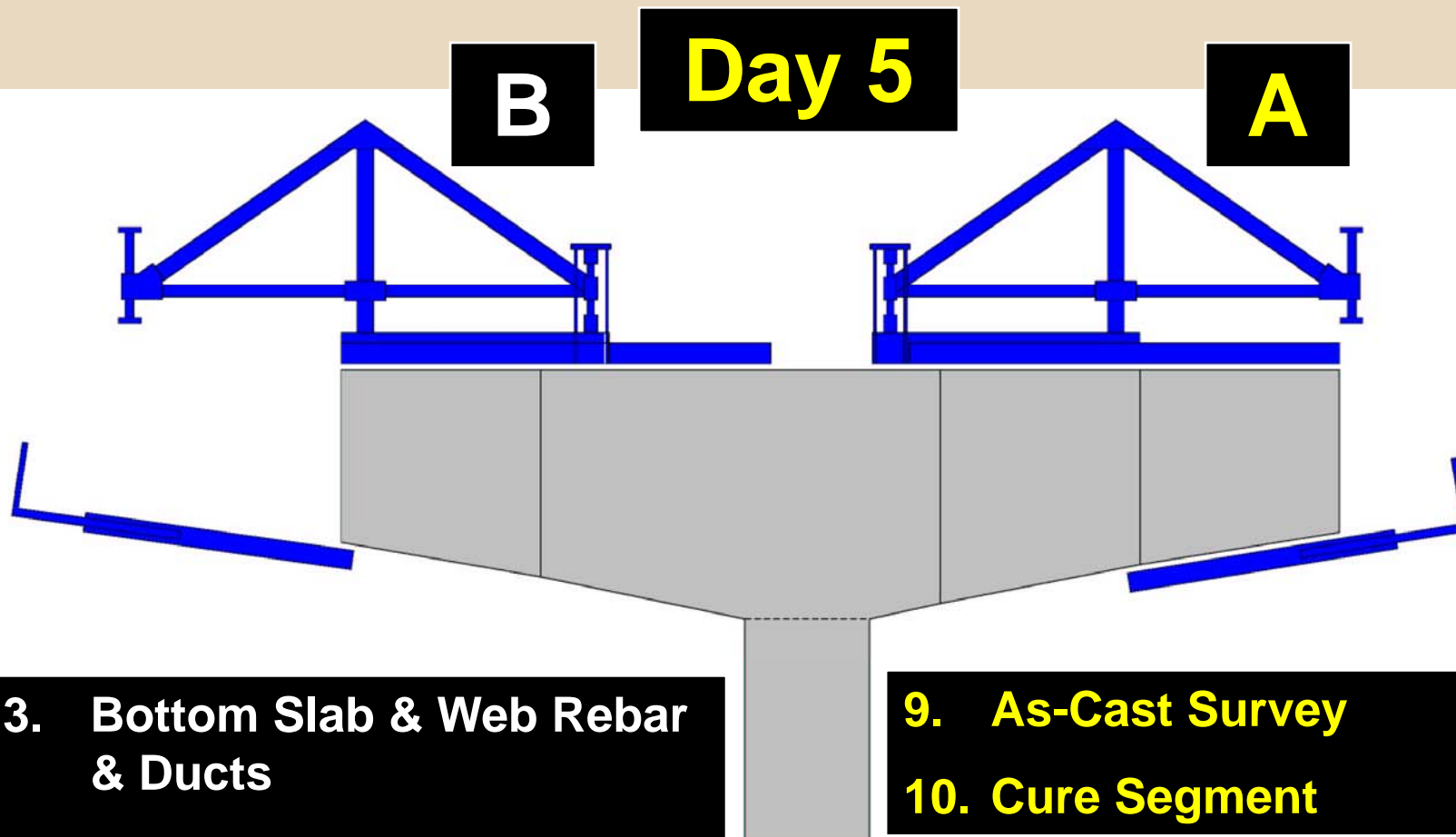
13. Advance Traveler

6. Top Slab Rebar & Ducts

Segment Casting Cycle



Segment Casting Cycle

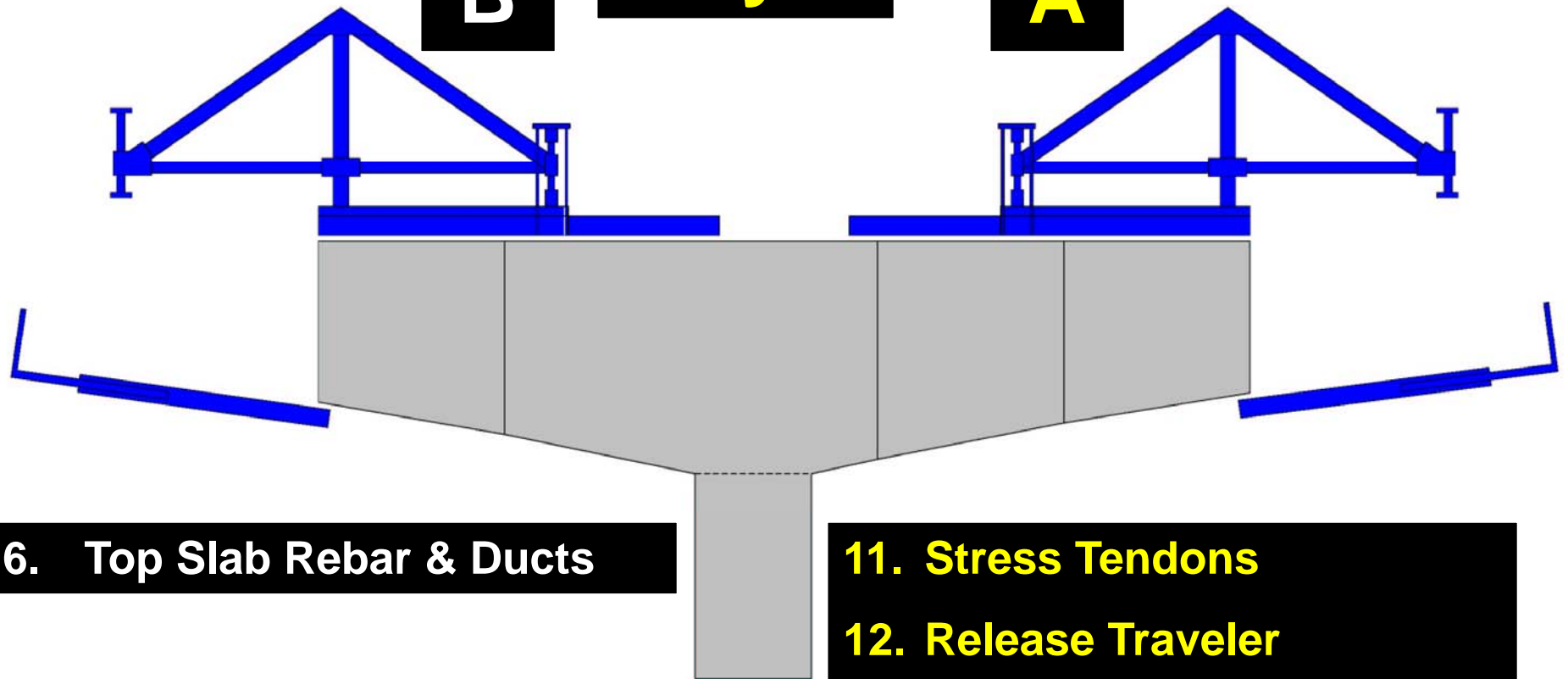


Segment Casting Cycle

Day 6

B

A



6. Top Slab Rebar & Ducts

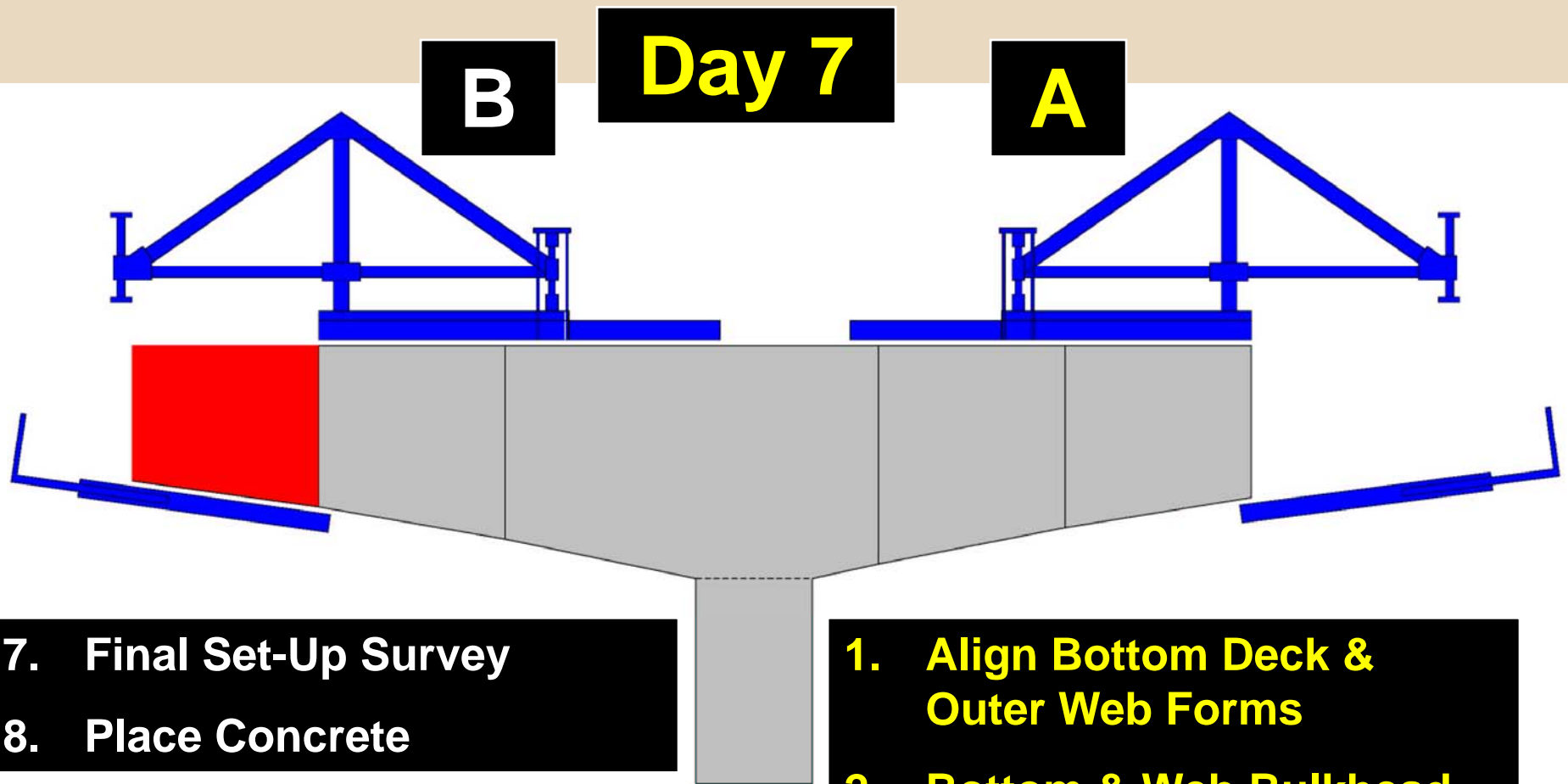
11. Stress Tendons

12. Release Traveler

13. Advance Traveler



Segment Casting Cycle



Typical Casting Cycle Duration

- **Casting Cycle Durations**
 - 7-10 Days / Segment 1st Cantilever
 - 5 Days / Segment Subsequent
- **Two or More Form Travelers**



Casting Cycle Duration

Wabasha Freedom Bridge

- **Normal Weather**
 - 8 Segments in 6 Days
(.75/day)
- **Cold Weather**
 - 4 Segments in 5 Days
(1.25/day)

2 Sets of Travelers



Segment Casting Cycle

- **Pier Table Construction**
 - Up to 33% of Total Cantilever Duration
- **Form Traveler Installation**
 - Typically 3 Weeks Per Traveler
- **Number of Form Travelers**
 - More Travelers Can Increase Efficiency



Segment Casting Cycle

- **Length of Cantilevers**
 - More Segments Increases Efficiency
 - Impact of Pier Table and Traveler Installation Reduced
- **Effect of “Learning Curve”**
 - 1st Cantilever Up To 2 x Typical Duration



Smart Road Bridge



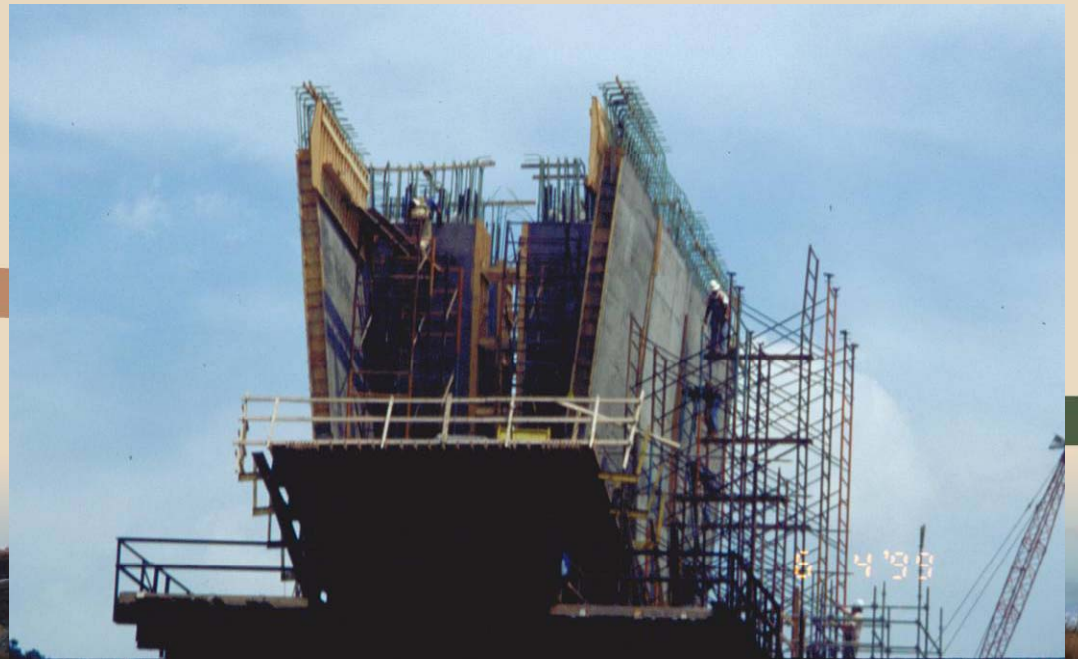
Smart Road Bridge

Piers



Smart Road Bridge

Pier Tables



Smart Road Bridge

Traveler Assembly



Smart Road Bridge

Traveler Assembly



Overhead Truss "Horse"
And Bottom Deck Form



Launching Rails
And Core Form

Smart Road Bridge

Traveler Assembly



Smart Road Bridge

Concrete Placement



Smart Road Bridge

Cantilever Construction



Smart Road Bridge

Forming Closure



Closure Segment

Completed Closure



Smart Road Bridge

Equipment on Deck



Smart Road Bridge



Wabasha Freedom Bridge



Wabasha Freedom Bridge

Pier Table



Wabasha Freedom Bridge

Pier Table



Wabasha Freedom Bridge

Form Traveler Installation



Launching Rails
and Formwork



Overhead Truss and
Launching Rails

Wabasha Freedom Bridge

Completed Travelers



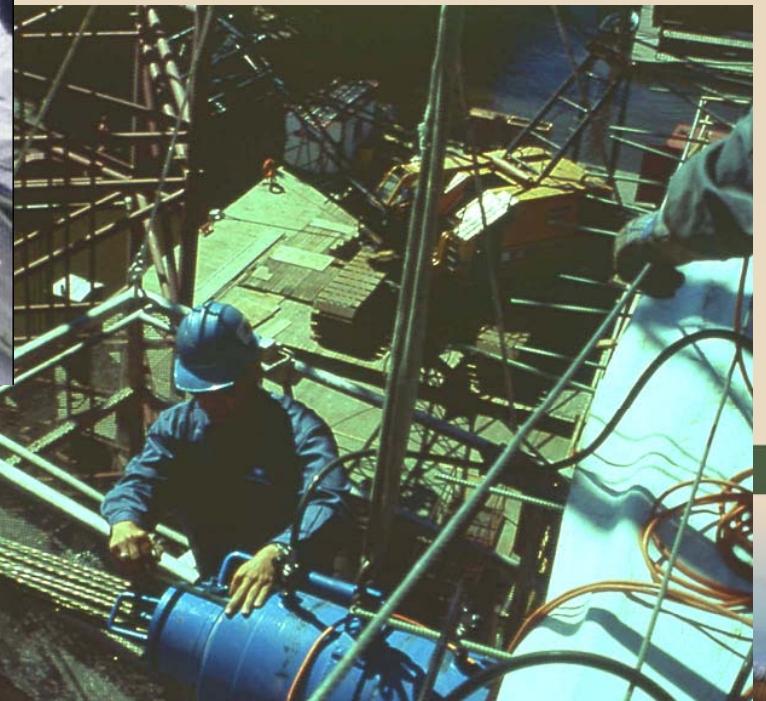
Wabasha Freedom Bridge

Cantilever Construction



Wabasha Freedom Bridge

Stressing Tendons



Wabasha Freedom Bridge



Allegheny River Bridge

Foundations



Allegheny River Bridge

Piers



Allegheny River Bridge

Pier Tables



Allegheny River Bridge

Pier Tables



Allegheny River Bridge

Pier Tables



Allegheny River Bridge

Traveler Assembly



Allegheny River Bridge

Traveler Assembly



Bottom Deck, Launching Rails, And Core Form

Allegheny River Bridge

Traveler Assembly



Allegheny River Bridge

Cantilever Construction



US-191 Over the Colorado River Bridge Replacement Project

Moab, Utah

Questions